NASA TECH BRIEF

Marshall Space Flight Center

Materials Data Handbook on Titanium 6Al-4V

Introduced in 1954, titanium 6Al-4V is as close as possible to a general-purpose titanium alloy. The alloy is a highly stabilized alpha-beta alloy, with aluminum as the alpha stabilizer and vanadium as the beta stabilizer; these impart toughness and strength at temperatures up to 750° F (399° C).

The alloy is highly resistant to salt water, many acids, alkalis, and other chemicals. It is near the noble end of the electrochemical series; its galvanic couples behave like austenitic steels. This alloy is protected by an inherent oxide film at low or moderate temperatures but is subject to oxidation at elevated temperatures.

Titanium 6Al-4V is machined readily if attention is paid to the rapid heat buildup at the cutting interfaces, to the reaction with the cutting tool (e.g., galling), and to the low modulus. Welding is reliable after considerations such as joint preparation, fitup, and shielding of the weld and heated zones. All standard sheet-metal techniques can be used for forming titanium 6Al-4V alloy. The normal forging temperature is 1750° F (954° C).

Typical applications of the alloy are in aircraft and missile structures, pressure vessels, chemical processing, and food processing. The alloy is available as sheet, strip, bar, billet, wire, extruded shapes, forgings, and castings.

To serve the needs of NASA designers, a handbook has been prepared which describes the latest property information on titanium 6Al-4V. The handbook is divided into twelve chapters. The scope of the information presented includes physical- and mechanical-property data at cryogenic, ambient, and elevated temperatures, supplemented with useful information in such areas as material procurement, metallurgy of the alloy, corrosion, environmental effects, fabrication, and joining techniques. Design data are presented, as available, complemented with information on the typical behavior of the alloy.

Information on the alloy is given in the form of tables and figures, supplemented with descriptive text, as appropriate. Source references for the information presented are listed at the end of each chapter.

Throughout the text, tables, and figures, common engineering units (with which measurements were made) are accompanied by conversions to International (SI) Units, except in the instances where double units would overcomplicate data presentation or where SI Units are impractical (e.g., machine tools and machining). In these instances, conversion factors are noted.

Note:

Requests for further information may be directed to:

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